CONTROL SYSTEM FOR DOOR OPENER

Background of the invention

The present invention is related to an electric/manual operation switching control system for a door engine, particularly to a door engine allowed for jointly cutting off circuit and releasing brake so as to automatically switch to a safe manual mode in any situation only if a pull chain is pulled; while a door engine with a self-braking device and an interlocking pull-chain disk device is disclosed in the present invention.

Description of the prior art

Accordingly, in the conventional electric doors, such as roll doors or garage doors ascending/descending vertically, roll doors rolling horizontally, garage doors opened/closed by 90°, and other door leafs opened/closed electrically, as examples, an abnormal manual mode is provided except for an electric mode. Generally, for the safety consideration, there are extremely restrict requirements for the design of common electric doors. Once the door leaf ascends (opens) or descends (closes), there is a possibility of danger due to the man-made or accident factors, whether the electric door is operated in a normal electric mode or abnormal manual mode. The primary factor of potential danger comprises the self-slippage of the door leaf due to the weight of the door leaf itself under a power failure situation. Therefore, an appropriate balanced weight, based on the size, height, and weight of the door leaf, is commonly installed according to the design of the industry. Typically, a ring-type torsional spring element is provided passing through a reel of the door leaf. By means of the counter torque provided by the torsional spring, the weight of the door leaf may be balanced. Ideally, a balanced weight within ± 35 lb for the door leaf is most safe and most easy for manipulation. In this case, any force exerted on the door leaf for pushing it upward or pulling it downward is inevitable less than 35 lb, regardless of the size or the height of the door leaf. This is the criterion commonly approved and followed by the industry.

Based on the aforementioned design requirements, the conventional door opener may be classified into three groups in accordance with the transmission structure through which the power is transmitted to an output shaft form a motor. According to this classification, the type of the door opener comprises: V-belt type, worm type, and spur gear type. The advantages and disadvantages of theses door openers may be

described comparatively as follows:

(1) V-belt type: As illustrated in Fig. 1a, the power from a shaft 2 of a motor 1 is transmitted to a speed reducer 4 via a V-belt 3, and then transmitted to a final output shaft 5. Owing to an extremely large frictional force existed between the V-belt 3 and pulley pairs 2a, 4a, the braking effect of this door opener is achieved by the wear of the V-belt 3. When the power is abruptly cut off during the ascending/descending travel of the door leaf, the motor 1 of the door opener still slips down due to the inertia (especially in the slippage travel). At this time, the frictional force between the V-belt 3 and the pulley pairs 2a, 4a is utilized to timely generate the braking effect, such that the door leaf may be balanced as desired. The advantage of this kind of door opener resides in that none of additional braking device needed to be added. However, the disadvantages thereof reside in non-compact construction, large volume, heavy weight, and low efficiency; especially reside in time-consuming and laborious installation and maintenance.

(2) Worm type: As illustrated in Fig. 1b, the power from the shaft of the motor 1 is outputted to the speed reducer 4 via a worm (not shown in this figure), and then transmitted to the final output shaft 5. Owing to the feature of irreversibility and the extremely low transmission efficiency inherent in the worm transmission, the door leaf of this kind of the door opener never slips down even if the power is abruptly cut off during the ascending/descending travel of this door leaf. The merit of this kind of the door opener resides in that an automatic braking effect is provided without the need for additionally installing a braking device due to that feature of irreversibility. However, the imperfections thereof reside in a lower efficiency of approximately 45%, such that the power difference between the input and the output is extremely large, and in complex material and manufacture of the worm and worm gear. Moreover, owing to a non-compact construction of a casing, and a large volume, the cost of the door opener of this kind is much higher than that of the V-belt door opener.

(3) Spur gear type: It is the transmission means used in the door opener to which the present invention is related. In this case, the power from the shaft of the motor is transmitted to an output end directly via a plurality of spur gear pairs with a specific gear-ratio. Owing to a feature of reversibility inherent in the spur gear transmission, the door leaf may slip down incapable of being braked, especially in the descending travel, due to the inertia of the motor of the door opener and the weight of the door leaf (less than 35 lb), if the power is cut off abruptly during the ascending/descending travel of the door leaf of this door opener. The merits of this kind of the door opener

are compactness as well as miniaturization, simple construction as well as low cost, and extremely high transmission efficiency of greater than 95%. However, the imperfection thereof is the feature of reversibility, such that a braking device must be added to balance the door leaf as desired. For the purpose of eliminating the imperfections of the door opener of this kind, an electromagnet means 224, braked electrically and interlocked with a pull-chain disk device in a manual mode, is provided in U. S. Patent No. 6,055,885, issued to the present inventor, as illustrated in Fig. 1c. If a motor 211 is electrified, the electromagnet means 224 may attract a pull-chain disk 225 (i.e., brake disk) to release the brake; while if the power is cut off abruptly, the pull-chain disk 225 is pushed against a clutch lining 226 fixed at a shaft 332 by a spring 2242 to brake, and the shaft 221 may be driven by pulling a pull chain in the manual mode.

In view of the increased cost, the inclusion of control lines, and the assembly of more parts as well as accessories, etc., resulted from electrical brake, in other words, the increased probability of breakdown, the technical level of technology, and the enlarged volume, the present inventor considers that a simplified construction, miniaturized volume, and reduced cost may be provided for a roll door of this kind, i.e., if a part of power is sacrificed, namely, the shaft of the door opener is permanently rubbed against a braking friction plate via a brake disk to generate a self-locking brake, such that the roll door may be balanced as desired. The inventor further contemplates that, for the door opener in an ideal case, once the pull chain is pulled, then the circuit is cut off and the brake is released jointly to automatically switch to a safe manual mode. Thereby, it is intended by the inventor to develop this present invention.

Summary of the invention

It is the primary object of the present invention to provide an electric/manual operation switching control system for a door opener allowed for jointly cutting off the circuit and releasing the brake so as to automatically switch to a safe manual mode in any situation only if a pull chain is pulled.

The control system according to the present invention comprises a housing accommodating a power unit driving a shaft electrically and transmitting the power to an output shaft; a braking device used for braking the shaft and releasing the shaft; a pull-chain disk device rotating the shaft indirectly by an external force exerted through a pull chain in a manual mode; a clutch device, disposed between the shaft and the pull-chain disk device, allowed for a restrainedly unidirectional transmission; a

protective device used for cutting off the circuit of the door opener in an abnormal situation; a driven disk interlocked with a clutch device for switching the protective device.

It is another object of the present invention to provide a door opener with a self-braking device, used for balancing a door leaf as desired and allowed for operating the door leaf by hand in a manual mode. For achieving this object, the present invention comprises:

a housing surrounding a first accommodating room and a second accommodating room partitioned by a rear cover; a power unit accommodated within the first accommodating room for driving a shaft; a first end of the shaft transmitting the power to an output shaft via a plurality of spur gear pairs, while a second end thereof pivoted on the rear cover and provided for extending in the second accommodating room; a braking device, accommodated within the second accommodating room, comprising a brake disk installed with a brake lining on one side thereof and fixed, at the center thereof, on the second end of the shaft to be rotated with the shaft together, a fixed plate located on the right side of the brake disk and formed with a pair of projecting pins at two opposite edges of a peripheral thereof, said fixed plate being fixed on the rear cover by a plurality of threaded fixing parts, each passing through a respective sleeve; a braking friction plate, disposed on the opposite side of the brake disk, formed with a plurality of axial through-open slots, at the positions corresponding to the sleeves on the fixed plate, for accommodating the sleeves such that the axial slide of the braking friction plate along the sleeves is obtained; a compression spring having two ends, one of which is provided for passing through a bearing support of the rear cover, and the other is butted against the braking friction plate to push the latter toward the brake lining for achieving an abuttingly braking state; an U-shaped sway plate having two legs, each pivoted on the corresponding projecting pin at each side of the fixed plate, the sway plate linked with a pull rod at the bottom thereof for pushing the braking friction plate toward a position not abutted against the brake lining, and extending a branch arm on the pull rod in a swing direction; a sensor switch fixed on the rear cover, including an abutting arm at a position not abutted against the branch arm, but allowed to be abutted against it in another situation. As such, when the power unit rotates, the permanent friction provided by the brake lining on the braking friction plate is used for generating the self-locking brake to balance the door leaf as desired, if the power is cut off abruptly during the ascending/descending travel of the door leaf; or the circuit of the door opener 10 may be cut off and the brake may be released jointly in any situation, for automatically switching to a safe manual mode, only that pulling the pull rod is

required.

It is still another object of the present invention to provide a door opener having a self-braking device and an interlocking pull-chain disk device, in which a door leaf may be operated by the pull-chain disk in a manual mode, except that the door leaf is balanced as desired by the self-locking brake.

In the present invention, the door opener is formed with a third accommodating room at the tail cover of the housing for accommodating the pull-chain disk separately. Moreover, a clutch device is designed between the shaft and the pull-chain disk device, such that the shaft may be rotated indirectly and restrainedly by the pull chain. The clutch device comprises a driven wheel fixed on the end portion of the second end of the shaft, and formed with a plurality of ratchets around the rim thereof, and a operating member used for restraining the driven wheel and having a central shaft hole at the top end thereof, an eccentric axial branch arm formed in a direction opposite to the driven wheel at the bottom end thereof, and two operating arms extending outside in diametrical direction on the left and right sides, respectively. The pull-chain disk device includes a pull-chain disk around which a pull chain is provided, pivoted on a central shaft of the tail cover, one side of the pull-chain disk being formed with a installation surface, while one side of the installation surface being further formed with a shaft pin pivoted in the shaft hole of the operating member, and on the installation surface a first through-hole being formed to be passed through by the branch arm of the operating member; a pair of positioning plates pivoted, at one end thereof, on the other side of the installation surface, and each hooking a tension spring in the middle thereof, respectively, such that a clamping potential energy may be stored between free ends for clamping two sides of the branch arm of the operating member to keep that operating member in a balance state; a driven disk coaxial with the pull-chain disk and on the right side thereof, the driven disk including a turning plate provided for extending in a limit portion of the tail cover, one end of the driven disk, facing toward the pull-chain disk, being formed with a projecting sleeve, born at the outside of the branch arm of the operating member and formed with a sliding slot around the internal rim of the sleeve; a resilient annular part with tension, embedded in the sliding slot of the sleeve and allowed to frictionally slide on the surface of the sliding slot, while formed with a pair of retaining arm, extending toward the center and allowed to abut against the branch arm, at two ends of the annular part. In this manner, when the brake is released by the pull rod and the pull chain is then pulled so as to rotate the pull-chain disk and thus, the operating member, the deflection will be imparted to the operating member, due to the fact that the branch arm may be leaned against the

retaining arm of the annular part in the rotary travel thereof and the annular part is provided with friction resistance. As the operating member deflects, an abutting state of the operating arm with the ratchet of the driven wheel is presented, in such a way that the driven wheel may be rotated restrainedly, and the shaft is then rotated indirectly. Thus, the ascending/descending of the door leaf may be operated.

Brief description of drawings

Fig. 1a is a diagram of the appearance of a conventional V-belt type door opener.

Fig. 1b is a diagram of the appearance of a conventional worm type door opener.

Fig. 1c is a diagram of a door opener braked electrically, which is redrawn form The U. S. Patent No. 6,055,885.

Fig. 2 is an exploded view of a door opener with a self-locking braking device according to one embodiment of the present invention, in which parts of members are omitted.

Fig. 2a is a substantially disassembled view observed from another angle according to the embodiment shown in Fig. 2.

Fig. 3 is a cross section diagram illustrating the braking state according to the complete embodiment shown in Fig. 2.

Fig. 3a is a diagram similar to Fig. 3, but the brake-releasing state is illustrated.

Fig. 4 is an exploded view of a door opener with a self-locking braking device and an interlocking pull-chain disk device according to one embodiment of the present invention, in which parts of members are omitted.

Fig. 4a is a substantially disassembled view observed from another angle according to the embodiment shown in Fig. 4.

Fig. 4b is a substantially disassembled view showing a portion including the pull-chain disk device.

Fig. 5 is a cross section diagram illustrating the braking state according to the complete embodiment shown in Fig. 4.

Fig. 6 is a partly cross section diagram similar to Fig. 5, showing the brake-releasing state after the pull chain is pulled.

Fig, 6a is a perspective view of the interlocking device shown in Fig. 6, but observed from another angle, in which parts of members are omitted.

Fig. 7 is a cross section diagram taken along the line 7-7 in Fig. 5, where an operating member is presented in a balance state.

Fig. 7a is a diagram showing the operating member of Fig. 7 when it is

presented in a deflection state.

Fig. 8 is a cross section diagram taken along the line 8-8 in Fig. 5.

Detailed description of the invention

Firstly, a door leaf, to which a door opener of the present invention pertains, is provided with a ring-type torsional spring element passing through a reel, as the typical one. By means of the counter torque provided by the torsional spring, the weight of the door leaf may be balanced. Ideally, a balanced weight within 35 lb for the door leaf is achieved, such that only an extremely small torque is required for the door opener to roll the door leaf. The technical features of the present invention will be clearly appreciated from the following detailed description of the preferred embodiment, which is merely one preferred example and not considered as restrictive, taken in conjunction with the accompany drawings.

Referring to Figs. 2, 2a, 3, and 3a, there is shown a door opener 10 having a self-locking braking device according to one embodiment of the present invention, comprising:

a housing 11 surrounding a space having a first accommodating room 11a and a second accommodating room 11c partitioned by a rear cover 11b inside thereof; a power unit 12, accommodated in the first accommodating room 11a, used for driving a shaft 120, the shaft 120 having a first end 120a and a second end 120b, the first end 120a extending outside the first accommodating room 11a and transmitting the power to an output shaft 16 via a plurality of spur gear pairs 14, and the second end 120b pivoted on the rear cover 11b and extending into the second accommodating room 11c;

a braking device 13, including a brake disk 132 disposed in the second accommodating room 11c and having two sides, a brake lining 131 being installed on the side thereof facing to the power unit 12 and passed through by the second end 120b of the shaft 120 at the center of the brake disk 132 so as to be integrally fixed with the shaft 120 to rotate therewith; a fixed plate 133, disposed within the second accommodating room 11c on the right side of the brake disk 132, having a peripheral and formed with a pair of projecting pins 134 at two opposite edges of the peripheral, the fixed plate 133 being fixed on the rear cover11b by a plurality of threaded fixing parts 135, each passing through a respective sleeve 135a; a braking friction plate 136, disposed within the second accommodating room 11c on the left side of the fixed plate 133, formed with a plurality of axial through-open slots 136a, at the positions corresponding to the sleeves 135a on the fixed plate 133, for accommodating the sleeves 135a, such that the axial slide of this braking friction plate along the sleeves

135a is obtained;

a compression spring 137 having two ends, one of which is installed on a bearing support 11b' at the right end face of the rear cover 11b, and the other is butted against the left end face of the braking friction plate 136 to push the latter toward the brake lining 131 for achieving an abutting state; an U-shaped sway plate 138 having two legs, each pivoted on the corresponding projecting pin 34 disposed at each side of the fixed plate 133, the sway plate linked with a pull rod 139 at the bottom thereof for pushing the braking friction plate 136 toward a position not abutted against the brake lining 131, and extendingly provided with a branch arm 139a on the pull rod 139 in a swing direction; a sensor switch 171, connected to the circuit of the door opener 10 and fixed on the rear cover 11b, including a abutting arm171a at a position not abutted against the branch arm 139, but allowed to be abutted against it in another situation.

In this door opener 10, referring to Fig. 3, when the power unit 12 rotates, the permanent friction provided by the brake lining 131 on the braking friction plate 136 is used for generating the self-locking brake from the friction resistance to balance the door leaf as desired, if the power is cut off during the ascending/descending travel of the door leaf. Moreover, Fig. 3a shows a brake-releasing state, in which the circuit of the door opener 10 may be cut off and the break may be released jointly in any situation for automatically switching to a safe manual mode, allowed for manually operating the roll door under the state of power failure, only that pulling the pull rod 139 is required. As shown in this figure, due to the fact that shaft holes 138a at two ends of the U-shaped sway plate 138 is pivotally supported on the projecting pins 134 disposed at two sides of the fixed plate 138, the braking friction plate 136 is rejected off the brake lining 131 slidingly by a projecting edge portion 138b, formed at the side of the U-shaped sway plate, forcing against the pressure of the compression spring 137, when the pull rod 139 is pulled down. Meanwhile, during the swing travel of the pull rod 139, an abutting arm 171a of the sensor switch 171 may be abutted against the branch arm 139a for cutting off the circuit of the door opener 10. At this time, the door leaf may be manually opened or closed with a pushing or pulling force, which may be less than 35 lb.

In another preferred embodiment of the present invention, shown in Figs. 4-8, there is provided with a door opener 10' having a self-locking braking device and an interlocking pull-chain disk device. In this embodiment, the door leaf may be operated by a pull-chain disk device 15 in a manual mode, except that the door leaf may be balanced as desired by the aforementioned self-locking braking device 13.

The present invention comprises: a housing 11 surrounding a space with two openings, the interior of the space being partitioned by a rear cover 11b into a first accommodating room 11a, a second accommodating room 11c, one of said openings being interconnected with an opening of a tail cover 11d, presented as a hollow cylinder, having a limit portion 11e at the bottom thereof for forming a third accommodating room 11d';

a power unit 12, accommodated in the first accommodating room 11a, for driving a shaft 120, the shaft 120 having a first end 120a and a second end 120b, the first end 120a extending outside the first accommodating room 11a and transmitting the power to an output shaft 16 via a plurality of spur gear pairs 14, while the second end 120b pivoted on the rear cover 11b and provided for extending within the second accommodating room 11c;

a self-locking braking device 13 including a brake disk 132 which, disposed within the second accommodating room 11c, comprises two sides, a brake lining 131 being installed on the side thereof facing to the power unit 12 and passed through by the second end 120b of the shaft 120 at the center of the brake disk 132 so as to be integrally fixed with the shaft 120 to rotate therewith; a fixed plate 133, disposed within the second accommodating room 11c on the right side of the brake disk 132, having a peripheral and formed with a pair of projecting pins 134 at two opposite edges of the peripheral, the fixed plate 133 being fixed on the rear cover 11b by a plurality of the threaded fixing parts 135, each passing through a respective sleeve 135a; a braking friction plate 136, disposed within the second accommodating room 11c on the left side of the fixed plate 133, formed with a plurality of axial through-open slots 136a, at the positions corresponding to the sleeves 135a on the fixed plate 133, for accommodating the sleeves 135a such that the axial slide of this braking friction plate along the sleeves 135a is obtained; a compression spring 137 having two ends, one of which is installed on a bearing support 11b' at the right end face of the rear cover 11b, and the other is butted against the left end face of the braking friction plate 136 to push the latter toward the brake lining 131 for achieving an abutting state; an U-shaped sway plate 138 having two legs, each pivoted on the corresponding projecting pins 134 at each fixed plate 133, the sway plate being linked with a pull rod 139 at the bottom thereof for extending outside the housing 11 and used for pushing the braking friction plate 136 toward a position not abutted against the brake lining131, while the pull rod 139 being extendingly provided with a branch arm 139a in a swing direction;

a clutch device 18, including a driven wheel 181 fixed, at the center thereof, on the end portion of the second end 120b of the shaft 120 and formed with a plurality of

ratchets 182 around the rim thereof, and an operating member 183 used for restraining the driven wheel 181, the operating member 183 further comprising a central shaft hole 183a at the top end thereof, an eccentric axial branch arm 183c formed in a direction opposite to the driven wheel 181 at the bottom end thereof, and operating arms 183b, 183b' extending outside in diametrical direction on the left and right sides, respectively.

a pull-chain disk device 15 including a pull-chain disk 151 accommodated within the third accommodating room 11d', the center of the pull-chain disk 151 being pivoted on a central shaft 122 of the tail cover 11d and a peripheral thereof is wrapped around a pull chain 152, one side of the pull-chain disk 151 opposite to the shaft 120 being formed with an installation surface 1510, while the side of the installation surface 1510 being further formed with a shaft pin 1511 pivotally supported in the shaft hole 183a of the operating member 183, and on the installation surface 1510 a first through-hole 1512 being formed to be passed through by the branch arm 183c of the operating member 183; a pair of positioning plates 155 pivotally supported, at one end thereof, on the other side of the installation surface 1510 by a pair of threaded fixing parts 156, and each having a groove 155a in the middle thereof, while the other end 155b thereof being presented as a free end 155b; in which, a second through-hole 1513 accommodating a tension spring 157 is provided on the installation surface 1510 between two positioning plates 155, and two ends of the tension spring 157 are hooked in the grooves 155a of the positioning plates 155, respectively, such that a claming potential energy may be stored between the free ends 155b of the pair of positioning plates 155 for clamping two sides of the branch arm 154c of the operating member 154 to keep the operating member 154 in a balance state (as illustrated in Fig. 4b);

a driven disk 158, coaxial with the pull-chain disk 151, having a central hole 158a pivoted on the base end of the central shaft 122 of the tail cover 11d, the driven disk 158, including a turning plate 158b, provided for extending in the limit portion 11e of the tail cover 11d, allowed for swinging within the limit portion 11e, and further formed with a locking groove 158c at the end of the turning plate158b, one end of the driven disk 158 facing toward the pull-chain disk 151 being formed with a projecting core tube 158d, born at the outside of the branch arm 183c of the operating member 183 and formed with a sliding slot 158e around the internal rim of the sleeve 158d; a resilient annular part 159 with tension, embedded in the sliding slot 158e of the core tube 158d and allowed to frictionally slide on the surface of the sliding slot 158e, while formed with a plurality of retaining arms 159a extending toward the center at two ends of the annular part 159; in which, the branch arm 183c of the aforementioned operating member 183 may pass through the first through-hole 1512 of the installation surface 1510 and then provided for extending inside the core tube 158d to finally lean

against the retaining arms 159a of the annular part 159 (as illustrated in Fig. 8);

a protective device 17, including a sensor switch 171 connected to the circuit of the door opener 10' and fixed on the rear cover 11b, the sensor switch 171 including an abutting arm 171a, located at a position, against which the branch arm 139a may be abutted in the swing travel of the pull rod 139, and a rotary arm 172 disposed between the pull rod and the turning plate 158b, the rotary arm 172 having a first end 172a and a second 172b, and the middle of the rotary arm including a shaft pin 172c pivotally supported in a shaft hole 11f of the limit portion 11e, in which the first end 172a is accommodated in the locking groove 158c of the turning plate 158b, while the second end 172b is formed with a V-shaped opening 172d widened gradually outwardly, the interior of the V-shaped opening 172d being born on the pull rod 139 (as illustrated in Fig. 6a).

In the aforementioned door opener 10', a non-abutting state of the operating arms 183b, 183b' of the operating member 183 with the ratchet 182 of the driven wheel 181 of the clutch device 18 is presented when the operating member 183 is maintained in a non-deflected balance state, i.e., the pull chain 152 has not been pulled, as shown in Fig. 7. Further, referring to Fig. 7a in comparison with Figs. 6, 6a, and 8, when the pull chain 152 is pulled and the pull-chain disk 151 is then rotated, the deflection will be imparted to the operating member 183, due to the fact that the branch arm 183c may be leaned against the retaining arms 159a of the annular part 159 in the rotary travel thereof and the annular part 159 is provided with friction resistance. As the operating member 183 deflects, an abutting state of the operating arms 183b, 183b' with the ratchet 182 of the driven wheel 181 is presented, so as to restrainedly rotate the driven wheel 181 and then rotate the shaft 120 indirectly. In the meantime, when the pull chain 152 is pulled to rotate the pull-chain disk 151, the branch arm 183c may be leaned against the retaining arms 159a of the annular part 159 and the driven disk 158 is thus rotated, such that the turning plate 158b in the lower end may be deflected by an angle within the limit range provided by the limit portion 11e (as illustrated in Fig. 8). On the other hand, as the first end 172a is turned by the locking groove 158c of the turning plate 158b, it is evident that the second end 172b may be rotated by an angle in an direction opposite to the turning, and a component of force may be simultaneously generated at the V-shaped opening 172d to push the pull rod off this opening along the inverse-taper edge, because the middle of the rotary arm 172 is pivoted on the limit portion 11e (as illustrated in Figs. 6 and 6a). Except for releasing brake accomplished by pushing the braking friction plate 136 off the brake disk 132, the branch arm 139a is simultaneously contacted with the abutting arm 171a of the sensor switch 171 in order for cutting off the circuit of the door opener 10'

during the swing travel of the pull rod 139, if the pull rod 139 swings. As such, in the non-manual mode, the power may be cut off immediately, if the pull chain is misoperated. In other words, once the pull chain 152 is pulled, whether in the electric or manual mode, the circuit of the door opener 10' is cut off interlocked with the release of the brake and the rotation of the shaft 120 so as to automatically switch to a safe manual mode. Thus, the safety is secured.

The aforementioned door opener may be applied for all door leafs opened and closed electrically, such as roll doors or garage doors ascending/descending vertically, roll doors rolling horizontally, or garage doors opened and closed by an angle of 90°. The foregoing description is merely one embodiment of present invention and not considered as restrictive. All equivalent variations and modifications in process, method, feature, and spirit in accordance with the appended claims may be made without in any way from the scope of the invention.

To sum up, the electric/manual operation switching control system of the present invention enables cutting off the circuit of the door opener interlocked with the release of the brake and the rotation of the shaft for automatically switching to a safe manual mode if the pull chain is pulled in any situation. Thus, the superior safety and the effect of simplified structure, miniaturized volume, and reduced cost for the door opener are achieved Therefore, this application is truly an invention with novelty, advancement, and availability by the industry.

List of reference numerals

10, 10'	door opener
11	housing
11a	first accommodating room
11b	rear cover
11b'	bearing support
11c	second accommodating room
11d	tail cover
11e	limit portion
11f	shaft hole
12	power unit
120	shaft
120a	first end
120b	second end

122	central shaft
13	braking device
131	brake lining (assembly)
132	brake disk
133	fixed plate
134	projecting pins 134
135	threaded fixing part
135a	sleeve
136	braking friction plate
136a	open slot
137	compression spring
138	sway plat
138a	shaft hole
138b	projecting edge portion
139	pull rod
139a	branch arm
14	spur gear pair
15	pull-chain disk device
151	pull-chain disk
1510	installation surface
1511	shaft pin
1512	first through-hole
1513	second through-hole
152	pull chain
155	positioning plate
155a	groove
155b	free end
156	threaded fixing part
157	tension spring
158	driven disk
158a	central hole
158b	turning plate
158c	locking pin
158d	core tube
158e	sliding slot
159	resilient annular part
159a	retaining arm
16	output shaft

17	protective device
171	sensor switch
171a	abutting arm
172	rotary arm
172a	first end
172b	second end
172c	shaft pin
172d	V-shaped opening
18	clutch device
181	driven wheel
182	ratchet
183	operating member
183a	shaft hole
183b, 183b	operating arm
183c	branch arm